Bibliographic Identification

Name and surname of the author: Mgr. Jan Jirovec

Name of dissertation: The level of influence of motor proficiency on the performance in the nonverbal aspect of intelligence in younger school-age children (6 – 11 years): A longitudinal study.

Workplace: Department of Kinanthropology and Humanities

Supervisor of the work: doc. PhDr. Martin Musálek, Ph.D

Year of presentation: 2021

Abstract

Motor development in children is often linked to the development of cognitive or executive functions. Nevertheless, it still remains unclear how much the level of children's motor proficiency can impact the level of nonverbal intelligence, which is an important part of academic achievement of children.

Objectives:

The aim of the dissertation thesis is to determine the level of influence and its stability in time between the level of motor proficiency and the performance in the nonverbal aspect of intelligence in younger school-age children with age (categories: 6 – 7 years, 8 – 9 years and 10 –11 years) and sex being considered.

Methods:

The research sample consisted of 396 children (n=214 girls, n=182 boys) aged 6 – 11 years (age 8,9±1.3) from two elementary schools (Karlovy Vary Region, Prague). The children were divided into 3 groups by age: 6 – 7 years, 8 – 9 years, 10 – 11 years. The Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2) test battery was used to determine the level of motor proficiency. Raven's standard progressive matrices (RPM) were used to determine the level of the nonverbal aspect of intelligence. The level of motor proficiency and the level of the nonverbal aspect of intelligence were measured twice for all evaluated participants, with half a year between the two measurements. The data were analysed using structural modelling, correlation analyses, regression analyses, and T-test statistics with a set level of statistical and clinical significance.

Results:

The results of the first measurement showed an acceptable quality of the structure of the BOT-2 (RMSEA=0,032; SRMR=0,025; CFI=0,99; TLI=0,98) and the RPM (RMSEA=0,079; SRMR=0,032; CFI=0,99 a TLI=0,97). However, the results of the repeated measurement manifested a significant deterioration of the structure of model fit of the BOT-2 (RMSEA=0,109; SRMR=0,053; CFI=0,88; TLI= 0,76) and the RPM (RMSEA=0,107; SRMR=0,053; CFI=0,89 and TLI=0,79) compared to the first measurement. Thus, the structure of both the BOT-2 and the RPM proved to be less stable in repeated measurement. We found that these differences were mainly caused by unexpected changes, improvements, in BOT-2 repeated performance in children from Karlovy Vary elementary school compared to children from Prague school along with variable changes in RPM performance.

In the first measurement, a significant influence of the fine motor construct (0,28) and the construct of strength and agility (0,48) on the level of performance in the RPM was detected in girls. In boys, only the strength and agility construct was determined as significant (0,38). In the second measuring, only the strength and agility construct showed significant influence on the performance in the RPM in girls (0,31)

The performance in the BOT-2 was the only significant predictor for the performance in the RPM in regression models in the first and second measuring for all age categories (6 – 7 years: β=0,39, CI 95% = 0,23–0,71; 8 – 9 years: β=0,24, CI 95% = 0,12–0,47; 10 – 11 years: β=0,36, CI 95% = 0,20–0,70). Neither BMI nor the weekly physical activity proved to be significant predictors for the performance in the RPM. The chronological age proved to be a significant predictor for the performance in the RPM in the first measuring only in the age category 8–9 years: β=0,39, CI 95% = 3,8 – 8,0.

In the assessment of the level of motor proficiency the following differences were found between girls and boys. In the first measurement using the BOT-2, girls achieved significantly better results than boys in the subtests fine motor precision, fine motor integration, manual dexterity, bilateral coordination. Boys achieved significantly better results in the subtests upper-limb coordination, balance, and strength. In the repeated measurement, girls achieved significantly better results than boys in the subtests fine motor precision, manual dexterity, bilateral coordination, and balance. On the other hand, boys achieved significantly better results in the subtests upper-limb coordination and strength.

Conclusion:

The level of motor proficiency has proved to have a significant influence on the level of the nonverbal aspect of general intelligence. The most important areas that seems to impact on the performance in the RPM are fine motor skills, strength and agility. It can be assumed that the influence of the individual aspects of motor proficiency differs with respect to gender. These findings show that the development of motor proficiency, primarily in the field of fine motor skills, agility and strength, should be used in the creation of intervention and motor skills educational programmes in schools with the aim to boost the mental development of younger school-age children.

Key words:

Motor Proficiency, Psychomotor development, Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2), Raven's Standard Progressive Matrices.